casual travelling companions, and from writers of the most various degrees of authority, that his statements can lay no claim to the serious attention of students of folk-lore, and present no interest for the English reader.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, May 25.—Prof. Reinold, President, in the chair.—The following papers were read:—On a relation existing between the density and refraction of gaseous elements and some of their compounds, by Rev. T. Pelham Dale. In a previous communication the author pointed out a relation between the specific refractive energies of sulphur and selenium, and the present paper deals with similar relations in gaseous bodies. On calculating out the values of $\frac{\mu - 1}{d}$ for the elements H, O, N, Cl, S, P, it was noticed that the logarithms were nearly integral multiples of half the logarithm for H, those for N, Cl, and P being double, and S and O three times that number. The value of $\mu - 1$ for different elements is compared with the $\mu - 1$ for H, the resulting numbers being, for oxygen 2, mercury 7, arsenic 8, and sulphur 12 nearly. Similar calculations are made for the compounds N_2O, NO, CO, SO_2, Cy, NH_3, HCl, H_2S, CH_4, and C_2H_4, but as the data obtainable are very rough, the numbers are not so closely integral. The author hopes that better data will be furnished by persons having greater facilities than himself for experimental research. Prof. Rücker thought the results obtained pointed towards some relation between the volumes of the molecules of different elements, and at the close of the meeting announced that on working out the relation he found the relative volumes to be a series of numbers in geometrical progression.—On a water-spray influence machine, by Mr. George Fuller. The apparatus is made up of four similar sections, each consisting of a nozzle, a metal ring, and a metal dish or receiver, arranged about a vertical axis. Pressure-water issues from perforations 1/100 inch in diameter in the nozzles, and passes through the rings into the insulated receiver below. The rings are placed at such a distance below the nozzles as to be about the point where the streams break into spray, and the receivers empty themselves automatically. Calling the consecutive sections 1, 2, 3, 4, respectively, the rings of 1 and 3 are connected to the receiver of 4, and those of 2 and 4 to the receiver of 1. The discharge-points are connected with the receivers 2 and 3, and a rapid succession of sparks passes when the water is turned on. Prof. S. P. Thompson inquired whether the length of the spark was limited by leakage along the glass rods or by the spray passing between the receivers, and in reply Mr. Fuller said he thought the former leakage the most important.—Notes on polarized light: (*a*) on the transition tints of various orders; (*b*) lecture illustrations of the rotation of circularly-polarized light; (*c*) on the rotation of circularly-polarized and non-polarized light, by Prof. S. P. Thompson. The first note described an inquiry as to what thickness of quartz gives the best "sensitive tint" for polarimetric work. Biot gave the name to the tint produced by a quartz 3¾ millimetres thick in a bright field, whereas in most modern polarimeters the name is given to that produced by 7½ millimetres of quartz in a dark field. The transition-tints of various orders were exhibited on a diagram of Newton's scale of colours, and by a wedge of selenite. Experiments were made on quartzes of 3¾ and 11¼ mm., giving tints of the first and second order respectively in the bright field, and with a 7½ mm. quartz in a dark field. The 3¾ was more sensitive than the 11¼ to small rotations, but the 7½ mm. seemed the best of the three. Prismatic analysis of the light transmitted by each led to the same conclusion—a new square-ended direct-vision prism built up of a glass prism (angle 140°) immersed in cinnamic ether being used for that purpose. The author pointed out that the "sensitive tints" of German opticians are decidedly redder than Biot's, and those generally used in England. In the first apparatus devised under (*b*), the ray of light is represented by a stretched cord thrown into promiscuous vibration by a tuning-fork, and the polarizer and analyzer are each represented by two plates of glass mounted parallel to each other about a millimetre apart, between which the cord passes. Between the polarizer and analyzer the vibrations are in one plane, and they are transmitted or cut off by the analyzer according as its plates are parallel or perpendicular to those of the polarizer. By blowing across one side of the spindle-shaped vibrating segment between the crossed plates, the plane of vibration is slightly rotated, and part is transmitted through the analyzer. Other experiments illustrating rotation of the plane of polarization were shown or described, the most conclusive being a bar of heavy glass placed along with a fish-eye lens between crossed Nicols. On starting a current in a helix surrounding the glass, the black cross formed by the fish-lens is seen to turn round as the current grows. Another piece of apparatus to illustrate Fresnel's view of the circularly polarized waves in quartz consists of two equal coplanar disks rotating in opposite directions, and carrying pins on which the extremities of a double pantograph arrangement are pivoted. The middle point of the link-work describes a line perpendicular or inclined to the line of centres of the disks according as the phases of the pins are the same or different. (*c*) In speaking of rotary polarization it is customary to say that the plane of polarization is rotated, but the author thinks it is equally correct to say that the light itself is rotated. Prof. Stefan's and Prof. Abbe's experiments bearing on the subject were described, and to demonstrate that ordinary light may be rotated, a biquartz was placed between a Fresnel biprism and the screen on which the interference fringes were formed. By using quartzes of thickness sufficient to rotate each beam 45°, the interference fringes are caused to disappear, and on inserting a bar of heavy glass in each of the pencils, and magnetizing one of them, the fringes reappear. Mr. Glazebrook thought the reason why 3¾ mm. quartzes were more sensitive than 11¼ might be seen by considering the sector-shaped spectrum in which the rays are spread out by the quartz, for with the thick piece the angle of the sector will be three times that with the thin one, and hence, in the latter case, a greater change of colour is produced by a given small rotation. Mr. Ward strongly condemned the use of biquartzes for rotation measurements, for he found it impossible to get them cut with such accuracy as to give a uniform tint; and if the light be slightly elliptically polarized, considerable error may be introduced. Speaking of magnetic rotation, he thought Fresnel's explanation unsatisfactory, and considered it probable that the rotary character of the magnetic field increases the period of one and decreases that of the other circular wave, their velocities remaining the same. As regards quartz, he believes the rotary action due to the light itself (probably an effect of the longitudinal wave), and not to any peculiar crystalline structure of the quartz, for liquids exhibit similar phenomena. Dr. Thompson, in reply, said Mr. Glazebrook's explanation of the difference in sensibility of the quartzes of various thicknesses was not quite satisfactory, for the reasoning would lead one to expect the 3¾ millimetres to be most sensitive, whereas experiment showed that the 7½ millimetres was best. He quite agreed with Mr. Ward about the defects of the biquartz, and thought the shadow method preferable in many cases. On the other hand, he was disposed to believe that the rotary power of quartz was a result of its crystalline structure, for fused quartz possessed no such property. As regards liquids, Dr. Thompson thought the rotation due to some kind of skew symmetry possessed by the molecules, the average effect of which is observed.—On the molecular weight of caoutchouc and other colloid bodies, by Dr. J. H. Gladstone, F.R.S., and Mr. W. Hibbert. This paper gives the results of determinations made by Raoult's method, the reliability of which was first tested by preliminary experiments on substances of known molecular weights, and found to be fairly satisfactory. The experiments on caoutchouc give a very high value (above 6000), thus confirming the author's previous impression that it was a colloid. Similar experiments were made on gum-arabic, caramel, albumen, and ferric and aluminic hydrates, all of which were found to have high molecular weights. All the experiments confirm the belief that the molecule of a colloidal substance is an aggregate of a very great number of atoms.

EDINBURGH.

Royal Society, May 20.—Sheriff Forbes Irvine, Vice-President, in the chair.—A paper, by Prof. Letts and Mr. R. F. Blake, on the identity of Hofmann's "dibenzyl phosphine" with oxide of tribenzyl-phosphine, and on some other points connected with the phosphorized derivatives of benzyl, was read.—Sir W. Turner communicated a paper by Dr. D. Hepburn, on the development of diarthrodial joints in birds and mammals.—Dr. G. Sims Woodhead communicated observations by Mr. D. McAlpine on the progressive movement of detached ciliated portions of frogs and tortoises, and also observations on the progression, pulsation

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and quivering of excised hearts of fish, frogs, reptiles, birds, and mammals.—Dr. John Murray read a paper by Mr. W. S. Anderson, on the solubility of carbonate of lime in fresh and sea water.

PARIS.

Academy of Sciences, May 27.—M. Des Cloizeaux, President, in the chair.—On the radicular nature of the stolons of *Nephrolepis*, by M. A. Trécul. In reply to M. Van Tieghem, the author argues that the so-called stolons of this fossil plant were not shoots or runners, but had the constitution of true roots; hence he was fully justified in describing them as "radicular stolons."—On the representation of the continuous fractions expressing the two roots of a quadratic equation, by Prof. Sylvester. In continuation of his previous paper (May 20), the author shows how the twin formulas there worked out for the two roots x and x' may be considerably simplified and generalized.—On the Calamariæ, *Arthropitus* and *Calamodendron*, by M. Grand'Eury. In this paper the author sums up his reasons for believing that these Carboniferous plants were highly organized Cryptogams. Their representatives or descendants in the Secondary formations were of smaller size, less varied, and more nearly related to *Equisetum*, the last degenerate survivor of the family.—Exact determination of the quantity of water contained in the blood, by MM. Gréhant and Quinquaud. Experiments made on the dog and rabbit show generally that the quantity of water is less in the venous than in the arterial blood. For the dog, the respective proportions were found to be: water, 77·09; dry residuum, 22·91; and 78·01 and 21·99 per cent.—Quantitative analysis of the urea contained in the blood and in the muscles, by the same physiologists. From these experiments, made with the rabbit and the skate, it would appear that the muscles of this fish contain fifty times more urea than those of mammals, and that the urea is formed in the muscles, in which it is present in larger quantity than in the blood.—Distribution in latitude of the solar phenomena during the year 1888, and solar observations for the first quarter of 1889, by M. Tacchini. The results of the observations here tabulated show that in 1888 the solar phenomena were much more frequent in the southern than in the northern hemisphere. The maximum zone for the spots, faculæ, and metallic eruptions lay between 0° and $-10°$, as in 1886 and 1887. But the maximum for protuberances does not correspond with that for the other phenomena, as it lay in higher latitudes ($+30$ to $+40$ and -40 to -50). The observations for the first three months of 1889 show a perceptible diminution of the spots and faculæ as compared with the last quarter of 1888, while the protuberances were somewhat more frequent in the former than in the latter period.—On the expansion of the metals at high temperatures, by M. H. Le Chatelier. In continuation of his previous communication the author here tabulates the results obtained for iron, steel, copper, aluminium, silver, nickel, platinum, and sundry alloys, concluding generally that for all metals the coefficient of expansion increases with the temperature. The law of increase is generally regular except for certain alloys of silver and for all varieties of iron.—Researches on the phenomenon of magnetic rotatory polarization in Iceland spar, by M. Chauvin. In a previous note (April 27, 1886) the author showed, against the opinion of Wertheim, that this substance possesses magnetic rotatory power not only in the direction of the axis but also in the neighbouring directions. His further researches here summarized generally confirm this conclusion, the phenomena observed being identical with those presented by natural quartz.—On the electric conductivity of saline solutions: reciprocal displacements of the acids, by M. P. Chroutschoff. A tabulation of the chief results already obtained of the reactions between salts in solution and acids other than those entering into the composition of the salt under examination.—Researches on the electric resistance of bismuth, by M. Edmond van Aubel. The author here studies the influence of temperature on the electric resistance of bars of bismuth, and examines this metal under two molecular states: melted and slowly cooled; melted and very rapidly cooled or tempered.—On the heat of combustion of some organic bodies, by M. J. Ossipoff. Continuing his determinations of the heat of combustion of organic bodies, the author here deals with racemic acid and its anhydride, and with methyl racemate and tartrate.—On some metallic sulphides, by MM. Armand Gautier and L. Hallopeau. Continuing their last memoir (April 15), the authors here describe the action of carbon disulphide on nickel, chromium, and lead.—Papers were contributed by M. F. Parmentier, on the presence of sulphate of soda in the atmosphere; by M. A. Haller, on a general method of synthesis for the β-acetonic acids of the aromatic series; and by M. E. Sorel, on the rectification of alcohol.—The President announced the death of M. Halphen at Versailles; and M. Hermite paid an eloquent tribute to the memory of the illustrious geometrician at his obsequies on May 23.—The death was also announced of the distinguished physicist and electrician, M. Gaston Planté.

VIENNA.

Imperial Academy of Sciences, March 21.—The following papers were read:—On Van Deen's blood-test and Vitali's pus-test, by E. Bruecke.—On some problems of the theory of the conduction of heat, by T. Stefan.—On the alterations of the pigment in the insect's eye, caused by the influence of light and its physiological meaning, by S. Exner.—New observations on the change of combinations in phenols (third communication), by T. Herzig and S. Zeisel.—On ortho-dicarbonic acids of pyridine, by G. Goldschmidt and H. Strache.

BOOKS, PAMPHLETS, and SERIALS RECEIVED

Petrographical Tables: H. Rosenbusch, translated by F. H. Hatch (Sonnenschein).—An Elementary Treatise on Mechanics: I. Warren (Longmans).—The Metallurgy of Silver: M. Eissler (Lockwood).—A Treatise on Geometrical Conics: A. Cockshott and F. B. Walters (Macmillan).—An Elementary Text-book of Chemistry: W. G. Mixter, 2nd edition (Macmillan)—A Practical Guide to the Climates and Weather of India, Ceylon and Burmah, &c.: H. F. Blanford (Macmillan).—Papers on Alternating Currents of Electricity: T. H. Blakesley, 2nd edition (Whittaker).—A Graduated Course of Natural Science, Part 1, 1st Year's Course: B. Lœwy (Macmillan).—International Annual of Anthony's Photographic Bulletin, vol. ii., 1889–90 (Illiffe).—British Dogs, No. 31: H. Dalziel (U. Gill).—La Période Glaciaire: A Falsan (Paris, Alcan).—Indian Meteorological Memoirs, vol. iii. Parts 3 and 4, and vol. iv. Part 5 (Calcutta).—Report on the Meteorology of India in 1887 (Calcutta).—An Elementary Treatise on Dynamics: B. Williamson and F. A. Tarleton, 2nd edition (Longmans).—Questions on Stewart's Lessons in Elementary Physics: T. H. Core (Macmillan).—The Middle Lias of Northamptonshire: B. Thompson: (Simpkin).—Essays upon Heredity and Kindred Biological Problems: A. Weismann; authorized Translation by Poulton, Schönland, and Shipley (Clarendon Press).—Himmel und Erde, Heft 9 (Berlin, Paetel).—Aus dem Archiv der Deutschen Seewarte, viii. Jahrgang, 1885 (Hamburg).—Observaciones Magnéticas y Meteorológicas del Real Colegio de Belen, 1^{er} Semestre, 1887 (Habana).—Veröffentlichungen aus dem Königlichen Museum für Völkerkunde, i. Band, 1 Heft (Berlin, Spemann).

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